

CLAIMS

WHAT IS CLAIMED IS:

1. A method for conveying network management information within a
network, the method comprising:
5 receiving an Ethernet packet at a network element;
 modifying the Ethernet packet by inserting a header in place of a preamble
within the packet, said header configured to provide support for network
management; and
 transmitting the modified packet from the network element.
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2. The method of claim 1 wherein the network element is in
communication with an optical network.
- 15 3. The method of claim 1 wherein said network management includes
operations, administration, and maintenance.

4. The method of claim 3 wherein the header comprises an operations, administration, and maintenance channel and further comprising transmitting operations, administration, and maintenance information from the network element to a network management station.

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5. The method of claim 3 wherein the header comprises an operations, administration, and maintenance channel and further comprising transmitting operations, administration, and maintenance information from the network element to other network elements.

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6. The method of claim 3 wherein said network management further includes provisioning of paths within the network.

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7. The method of claim 3 wherein said network management further includes performance monitoring of paths within the network.

8. The method of claim 1 wherein said header includes the same number or a fewer number of bytes than the preamble of the Ethernet packet so that a size of the packet is not increased when the preamble is replaced by the header.

9. The method of claim 8 wherein said header comprises 8 bytes.

10. The method of claim 1 wherein the network element is located on an edge of an optical network.

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11. The method of claim 1 wherein said header includes application specific information.

12. The method of claim 1 wherein said header includes an error-detecting code word to detect errors in the header.

13. The method of claim 12 wherein said error detecting code is a cyclic redundancy check field.

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14. The method of claim 1 wherein said header includes a message channel.

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15. The method of claim 14 further comprising using HDLC on the message channel.

16. The method of claim 1 wherein said header includes packet type information.

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17. The method of claim 16 wherein the packet type information identifies whether the packet is an idle packet or a data packet.

18. The method of claim 16 wherein the packet type information identifies that the Ethernet packet has been modified.

19. The method of claim 1 further comprising providing sideband communication within the network via a sideband channel.

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20. The method of claim 19 further comprising IP routing over the sideband channel to enable communication of management data.

21. The method of claim 19 further comprising using the sideband channel to perform topology discovery.

22. The method of claim 1 wherein the network has a hub topology.

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23. The method of claim 1 wherein the network has a mesh topology.

24. The method of claim 1 wherein the network has a ring topology.

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25. The method of claim 1 further comprising inserting an idle packet into a packet stream at the network element during periods when no data is received by the network element.

26. The method of claim 1 further comprising removing said header and replacing the preamble in the modified packet.

27. The method of claim 26 wherein removing said header comprises removing said header at an egress boundary of the network.

28. The method of claim 1 wherein inserting said header comprises
inserting said header at an edge of the network.

29. The method of claim 1 further comprising transmitting a defect
5 indicator within said header.

30. The method of claim 29 further comprising switching a receiving
node to a backup path.

10 31. The method of claim 1 further comprising providing an automatic
protection switching subchannel within said header.

32. The method of claim 1 further comprising multiplexing packet
streams at the network element.

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33. The method of claim 32 wherein said header comprises a subinterface
identifier which identifies an originating port for each of the packets.

34. The method of claim 32 further comprising demultiplexing the packet streams at a receiving node.

5 35. The method of claim 1 wherein the network comprises a plurality of network elements.

10 36. The method of claim 35 further comprising a network management station and wherein the management station has access to said plurality of network elements via said header.

15 37. The method of claim 35 further comprising communicating routing table information among said plurality of network elements via said header.

38. The method of claim 1 further comprising receiving the modified packet at a transit node, modifying said header, and forwarding the packet.

15 39. The method of claim 1 wherein the network element is in communication with at least one host computer.

40. The method of claim 1 wherein the network element is in communication with at least one router.

5 41. A method for supporting management of a network, the method comprising:

receiving a modified Ethernet packet at a network element, the modified packet comprising a header configured to provide support for network management;

10 replacing the header in the modified packet with a preamble within the packet to create an Ethernet packet; and

transmitting the Ethernet packet from the network element.

15 42. The method of claim 41 wherein the network element is located at an egress boundary of the network.

43. The method of claim 41 wherein receiving a modified Ethernet packet comprises receiving the modified packet from a transit network element located within the network.

44. The method of claim 43 wherein the network element is in communication with an optical network.

5 45. A system for conveying network management information in a network, the system having a network element comprising:

a port controller operable to receive a packet, modify the packet by inserting a header in place of a preamble within the packet, said header configured to provide support for network management; and

10 a network element controller coupled to the port controller and operable to generate and consume network management information.

15 46. The system of claim 45 wherein the port controller comprises an optical to electrical converter and a CDL handler operable to insert the header into the packet.

47. The system of claim 45 further comprising a crossconnect configured to receive the packet from the port controller and select an egress port controller to transmit the packet from the network element.

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48. The system of claim 45 further comprising a second network element positioned at an egress boundary of the network, the second network element comprising:

a port controller operable to receive the modified packet and replace the header with the preamble; and

a network element controller coupled to the port controller and operable to generate and consume network management information.

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49. The system of claim 48 wherein the port controller comprises a CDL handler and an electrical to optical converter.

50. The system of claim 48 wherein the port controller comprises a CDL

handler and an optical to electrical converter.

51. The system of claim 48 wherein the second network element is a downstream network element and further comprising a transit network element

operable to receive the modified packet, modify the header, and forward the packet to the second network element.

52. The system of claim 45 wherein the header comprises:

- 5 an operations, administration, and maintenance field;
- a message channel;
- an application specific field; and
- a header error detection field.

10 53. A computer program product for conveying network management information within a network, the product comprising:

- code that modifies an Ethernet packet by inserting a header in place of an Ethernet preamble within the packet, said header providing support for network management;
- 15 code that transmits the modified packet from a network element; and
- a computer-readable storage medium for storing the codes.

54. The computer program product of claim 53 further comprising code
that removes said header from the modified packet and replaces the preamble.

55. The computer program product of claim 53 further comprising code
that provides sideband communication within the network.

56. The computer program product of claim 53 further comprising code
that provides each of the packets with a subinterface identifier within said header
to allow multiplexing of packet streams.

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57. A system comprising:
a processor that executes a program for modifying an Ethernet packet to
provide OAM capabilities, said program comprising:
code that modifies an Ethernet packet by inserting a header in place of an
15 Ethernet preamble within the packet;
code that transmits the modified packet over a path within a network; and
a computer-readable storage medium having said program stored thereon.

58. A system for supporting network management, the system comprising
a handler operable to remove a preamble from an Ethernet packet and insert a
header, said header comprising:

an operations, administration, and maintenance field;

5 a message channel;

an application specific field; and

a header error detection field.

59. The system of claim 58 wherein said header includes the same
10 number or a fewer number of bytes than the preamble it replaced.

60. The system of claim 58 wherein said header further comprises a
defect indication field that instructs a receiving node to switch to a backup path.

15 61. The system of claim 58 wherein the application specific field
comprises a subinterface identifier for use in demultiplexing packet streams.

62. The system of claim 58 wherein the header error protection field is a header cyclic redundancy check.

63. The system of claim 58 wherein the header includes fields for SRP.

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64. A system for supporting management of a network, the system comprising a handler operable to wrap a digital wrapper around a data link layer, the digital wrapper comprising:

an operations, administration, and maintenance field;

a message channel;

an application specific field; and

a header error detection field.

65. A system for conveying network management information, the system

15 comprising:

means for receiving a packet at a network element;

means for modifying a preamble of the packet to support network management; and

means for transmitting the modified packet.

66. The system of claim 65 wherein means for modifying the packet comprises hardware.

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67. The system of claim 65 wherein means for modifying the packet comprises microcode.

68. The system of claim 65 wherein means for modifying the packet comprises software.

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69. The system of claim 65 wherein means for modifying the packet comprises photonic logic.

15 70. The system of claim 65 wherein the network element is located at an ingress boundary of the network.

71. The system of claim 70 wherein said means for modifying the preamble comprises means for replacing an Ethernet preamble with a CDL header.

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72. The system of claim 65 wherein the network element is located at an egress boundary of the network.

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73. The system of claim 65 wherein said means for modifying the preamble comprises means for replacing a CDL header with an Ethernet preamble.

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74. The system of claim 65 wherein the network element is a transit network element.